Acta Palaeontologica Polonica
Vol. 28, No. 1—2 pp. 205—207 Warszawa, 1983
Second Symposium on Mesozoic Terrestial Ecosystems, Jadwisin 1981

TERESA MARYAŃSKA and HALSZKA OSMÓLSKA

SOME IMPLICATIONS OF HADROSAURIAN POSTCRANIAL ANATOMY

MARYAŃSKA, T. and OSMÓLSKA, H.: Some implications of hadrosaurian postcranial anatomy. Acta Palaeont. Polonica, 28, 1—2, 205—207, 1983.

All articulated hadrosaurian skeletons expose a comparatively abrupt ventral flexure of anterior thoracal portion of the vertebral column. This resulted in effective shortening of the body anterior to the acetabulum and in shifting backward the gravity center of the heavy thoracal part, in deepening of pleural cavity as well as in lowering the suspension point of the fore limb at the glenoid, making easier access of the fore limb to the ground. In some hadrosaurs at least, sacropelvic contact was strengthened by a forward extension of the acetabular bar, so that pubis also was keyed to sacrum by a sacral rib, and the puboiliac contact was reinforced. This enabled these hadrosaurs to assume and sustain a stance with the vertebral column inclined upwards.

Key words: dinosaurs, Hadrosauridae, Upper Cretaceous, anatomy.

Teresa Maryańska, Muzeum Ziemi, Polska Akademia Nauk, al. Na Skarpie 20/26, 00-488 Warszawa; Halszka Osmólska, Zakład Paleobiologii, Polska Akademia Nauk, al. Żwirki i Wigury 93, 02-089 Warszawa, Poland. *Received: November 1981.*

INTRODUCTION

During our work on the postcranial skeleton of *Saurolophus angustirostris* (Maryańska and Osmólska in press) some aspects of hadrosaurian skeleton drew our attention, which were so far often overlooked. These are: a strong ventral inclination of the anterior thoracal portion of the vertebral column and the vertical position of the neck, which are visible in naturally articulated skeletons, as well as a peculiar character of the anterior junction between pelvis and sacrum. A more detailed description of these structures will be found elsewhere (Maryańska and Osmólska in press).

NECK AND CURVATURE OF THE VERTEBRAL COLUMN

Most of hadrosaur skeletons found in articulation display a vertically positioned neck passing backward, through an U bend, into the anterior thoracal portion of the vertebral column, which is strongly inclined ventrocranially. More posteriorly, the thoracosacral and caudal vertebral series is more or less horizontal (see Galton 1970). It seems most probable that such an arrangement reflects a natural curvature of the vertebral column, and it had, at least, two effects:

1. The preacetabular portion of the body became deeper and shorter; the latter resulted in the backward shifting of its gravity center. It made counterbalancing of the body by the tail easier while the animal progressed bipedally with horizontally held vertebral column. Note, that for reasons of stability the neck should be then held vertically and the head thrusted back and forth adjusting the gravity center during walk.

2. The scapulocoracoid migrated parallelly to the adjoining inclined portion of the vertebral column, the scapula about equalling the length of this portion. It caused not only lowering of the glenoid but also its more backward facing. Lowering of the glenoid made easier an access of the fore limb to the ground and might enable an occasional quadrupedal stance, although no quadrupedal progression on the hard ground, against which the characters of manus and carpal joints testify.

PELVICOSACRAL CONTACT

The so-called iliac, or acetabular bar, formed of the broadened and fused distal ends of sacral ribs, is longer than the central acetabular portion of ilium in *Saurolophus angustirostris*, and it extends anteriorly beyond the pubic peduncle of the ilium. It is placed almost on the same height as the articular surface of this peduncle. As a rule, the pubic peduncle of a hadrosaur ilium is very light and provides but a small articular surface for the contact with iliac peduncle of the pubis. On the contrary the latter is very broad, massive and provides a large articular surface, quite disproportional in the size to the surface on the ilium. In *S. angustirostris*, the articular surface on the iliac peduncle of pubis is developed in two planes being at an angle to each other: one, facing the surface on the ilium, the other, larger, medial to the projection of the pubic peduncle of ilium. The latter surface is about parallel to the broad distal articular surfaces provided by two anterior sacral ribs of the acetabular bar, which extend forward beyond the central body of the ilium. It is thus evident that these sacral ribs contacted the pubis and braced the entire puboiliac contact. This mode of pelvicosacral articulation was not the exclusive character of *S. angustirostris* because it seems to be present also in many other hadrosaurs (e.g. *C. casuarius* — Brown 1916: pl. 14; *C. intermedius*

and *C.* cf. *intermedius* — Parks 1935: pl. 6; *P. maximus* — Parks 1924: pl. 5). A somewhat similar case was described in other ornithopods by Galton (1974*a*, 1974*b*).

The above described structure of the pelvicosacral region strengthened significantly the contact between the sacrum and the elements of pelvis. It may evidence, that these ornithopods had the puboiliac contact strong enough to maintain the position of the vertebral column raised to about 50° to the horizontal (see also Norman 1980), and were essentially high-browsers.

CONCLUSION

Basing on the facts mentioned above, we consider hadrosaurs as terrestrial habitual bipeds, which progressed with the vertebral column held horizontally along the posterior dorsal, sacral and anterior caudal series. During progression, they held the neck vertically, thrusting the head forth and back to adjust the gravity center. The strongly sloping cranioventrally anterior part of thoracal vertebral series shortened the preacetabular portion of the body, which was advantageous in bipedal progression, and deepened the pleural cavity. Hadrosaurs were able to achieve the inclined upward stance while feeding. The quadrupedal stance might be maintained during processing the food and resting.

REFERENCES

BROWN, B. 1916. *Corythosaurus casuarius*: skeleton, musculature and epidermis. — *Bull. Amer. Mus. Nat. Hist.*, **35**, 37, 709—716.

GALTON, P. M. 1970. The posture of hadrosaurian dinosaurs. — *J. Paleont.*, **44**, 3, 464—476.

— 1974*a*. The ornithischian dinosaur *Hypsilophodon* from the Wealden at the Isle of Wight. — *Bull. Brit. Mus.* (*Nat. Hist.*), **25**, 1, 1—152.

— 1974*b*. Notes on *Thescelosaurus*, a conservative ornithopod from the Upper Cretaceous of North America, with comments on ornithopod classification. — *J. Paleont.*, **48**, 5, 1049—1066.

MARYAŃSKA, T. and OSMÓLSKA, H. (in press). Postcranial anatomy of *Saurolophus angustirostris* with comments on other hadrosaurs. *In*: Z. Kielan-Jaworowska (ed.), Results Pol.-Mong. Palaeont. Expeds., X. — *Palaeont. Polonica*, **46**.

NORMAN, D. B. 1980. On the ornithischian dinosaur *Iguanodon bernissartensis* of Bernissart (Belgium). — *Mém. Inst. Roy. Sci. Nat. Belgique*, **178**, 1—105.

PARKS, W. A. 1924. *Dyoplosaurus acutosquameus*, new genus and species of armoured dinosaurs; and notes on a skeleton of *Prosaurolophus maximus*. — *Univ. Toronto Studies, geol. ser.*, **18**, 26—35.

— 1935. New species of trachodont dinosaurs from the Cretaceous formations of Alberta with notes on other species. — *Ibidem*, **37**, 5—45.